Modeling Effort Part 2:

Trip Generation

Current Methodologies
Proposed Changes
Checks We Perform

Modeling Effort Part 2:   Trip Generation

Housing Rating system - applies a rate based on house rating

The standard rates for us have typically been**:

Excellent DU's (EXGR)	=	12 trips/DU
Above Average (AAGR)	=	10 trips/DU
Average (AVGR)	=	8 trips/DU
Below Average (BAGR)	=	6 trips/DU
Poor (PRGR)	=	4 trips/DU

Total Productions Zone$_i$ = (EXGR)X$_{EX}$ + (AAGR)X$_{AA}$ + (AVGR)X$_{AV}$ + (BAGR)X$_{BA}$ + (PRGR)X$_{PR}$

Where   X = number of DU's
         i = Zone number

**Vehicle trips

Discussed the data collected-houses by category

IN trip gen it is just a rate applied to each category

Set of rates was determined quite some time ago. Rate per DU

basic equation

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Vehicle Trip Production Rates

Housing Classification	1995 Triangle Household Survey	Triad Survey	National Data *[FHWA]*
Excellent	9.4*	9.3	11.2
Above Average	9.4*	9.1	11.2
Average	8.3	7.7	8.3
Below Average	6.2*	6.3	5.4
Poor	6.2*	5.7	5.4
All Dwelling Units	7.8	7.4 - 8.0	7.8

*Categories had to be combined to achieve a statistically significant sample

Produces total trips by zone
Then assumptions about the purposes are made

Purpose	Triangle Survey*	Triad Survey*	Charlotte Region*	National
HBW	22%	20%	19%	18 - 25%
HBO	46%	49%		47 - 58%
NHB	32%	31%		18 - 28%

*Incorporates urban and non-urban households

Basically a hand cross-class in the field.

Doesn't compare area to area because of subjectivity of the rating system. However the rate/DU still come out reasonable to other natinoal #'s

also assumptions about the % of trips varies and is random by some sorts

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New methodology - Single Class using census data

Get data by TAZ for each area from census

Asheville Travel Demand Model
From Model Methodology, Final Draft

Trip Production Variables, by Purpose

Independent Variable	HBW	HBS	HBE	HBO	NHB
Persons/Household		✗		✗	✗
Workers/Household	✗				
Persons < Age 18/Household			✗		
Area Type		x			

✗ = Primary variable   x = Secondary variable

This is the Trip Gen methodology used based on the data that beverly talked about this morning.

The data comes from the census by TAZ. Easily obtainable data.

One of our local consultants, Don Bryson, looked at the strengths/weaknesses of different variables and their effect on the generation of trips

strongest predictors of trips by purpose is the # of persons eligible or most expected to make that trip.

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Trip Production Variable Stratification

Independent Variable	Strata
Persons/Household	1, 2-3, >3
Workers/Household	0, 1, 2, >2
Persons < Age 18/Household	0, 1-2, >2
Area Type	Rural, Non-rural

Daily HH Trips Rates for HBW

Workers/HH	HBW Trips/HH
>2	4.35
2	2.69
1	1.43
0	0

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Daily Trip Rates for HBO Trips

HH Size	HB0 Trips/HH
>3	4.49
2 or 3	2.33
1	.87

Daily Trip Rates for NHB Trips

HH Size	HB0 Trips/HH
>3	4.13
2 or 3	2.56
1	1.5

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Larger Areas- Cross-classification

Primary variables - Using HH size vs income
also - HH characteristics in some areas
auto ownership too

Use rates based on surveys for each model

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Attraction Methodology -

All our models use regression equations

SCOT'S EQUATION:

$$Y= 1(X1) + 1.83(X2) + 8.36(X3) + 2.6(X4) + 2.55(X5s) + 0.5(DU)$$

Where:		
	X1 =	Number of Industrial employees in a TAZ
	X2 =	Number of Retail employees in a TAZ
	X3 =	Number of Highway Retail employees in a TAZ
	X4 =	Number of Office employees in a TAZ
	X5 =	Number of Service employees in a TAZ
	DU =	Number of Dwelling Units in a TAZ

Based on work by Scot Leftwich- he looked at several surveys in NC (16 or so) - older studies however

he determined that based on the SIC classifications that we use (the 5 categories) that attractions would/can be represented by this equation!

This eq & its coefficients were used for years and still sometimes are. Some of the coefficients seem a little off so recently some survey data for larger areas have been deemed a closer representation for our MPO areas.

Shown on next page

Modeling Effort Part 2: Trip Generation

Equations transferred between areas
Triangle Study used most often

Employment Type	HBW	HBO	NHB	Ext-Int
Industry	1.2	0.63	1.1	0.34
Retail	1.2	3.4	1.0	0.49
Highway Retail	1.2	4.2	4.0	0.28
Office	1.2	1.2	1.1	0.28
Service	1.2	2.0	1.9	0.28
Dwelling Units	0	0.9	0.13	0.33

Adjustments to the factors are made after performing generation checks

Because we do a lot of the modeling across the state and generally are responsible for the data, we have not done a ton of travel surveys recently

therefore we are forced to borrow/transfer between areas.

You can see the coefficients are different than the equation originally established

Modeling Effort Part 2:
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Commercial Vehicles

Large areas- we have survey data to use
for rates & equations

Commercial trip productions (trips/vehicle)

Employment Type	Auto	Large Truck
Industry	2.49	6.62
Retail	2.89	7.86
Highway Retail	--	--
Office	--	--
Service	3.43	2.0

Commercial trip attractions (trips/employee)

Employment Type	Auto	Large Truck
Industry	.2	.75
Retail	.33	.67
Highway Retail	.25	.50
Office	.10	.21
Service	.12	.23

Smaller areas- assumed an average production rate
Equations take into acct commercial's

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What do we think we will be doing?

       Single class using census data for non-regional models
       Use variables as described previously
       Transfer rates from newer surveys

Things we want to consider:

Take recent surveys and combine to do some analysis
Look at employment category groupings
Smaller urban surveys to compare to larger results for transferability

Other areas-how do they handle smaller areas?

Single class-using the "new method"

b/c- ease of data collection, common method across models

easier forecasting

can be replicated

Are these variables reasonable???

Is the single class reasonable?

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Special Generators- have a wide variety of them
                    Classify wide variety of things
                            shopping centers
                            universities
                            military bases
                            etc.

    # of employees by type
    traffic counts
    # of students
    # of housing (military)

How do we handle them?

Typically we use them for everything.

Usually run in regular Trip Gen and then pull out if it doesn't seem reasonable.

However, rates for them are arbitrary or borrowed based on past models. These past models may/may not be exactly right thoough. So not sure about the rates.

Is this the right process? Should we use the trip generation manual or perform a case by case basis where you get counts and the proper locations and back calculate into a rate that produces the right amount of trips?

How do you guys define special generators? Is there a threshold valur for trip amount? Type of business?

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OTHER

Person trips? Vehicle trip? Household?
-which rates are most common
-What should we use?

Productions/attractions -
we balance to our productions for:
HBW, HBO, HBS

but to attractions for NHB

Is this the standard still?

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NHB by non-residents

      Current process is an assumed proportion
      Similar to internal NHB purpose-since no survey data
      Added to NHB trip purpose in model

How should they be accounted for if data is not there?

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Future Year Data-

Currently forecasted differently in each area
Depends on the variables being used

Forecast population & employment totals based
on current growth trends-locals & us together

Areas independent of each other

No State/regional control totals

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How should we get at the future #'s??

State controls? regional controls? Area controls?

Same process for all models? Larger ones different?

Smaller areas- forecast total housing and use percentages
                from census?